

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

We claim:

1. A microprocessor based smart resolution valve pressure control system for performing a wheel slip control valve response test, said microprocessor based smart resolution valve pressure control system comprising:

a) a sensing means for ensuring that brakes disposed on a truck of a vehicle are at full service and that a truck brake cylinder pressure (BCP) is greater than a first predetermined BCP;

b) a first testing means connected to a wheel slip control valve for operating said wheel slip control valve in response to sensing that said brakes disposed on said truck are at full service and that said first truck BCP is greater than said first predetermined BCP and for pulse releasing said wheel slip control valve to determine an elapsed time that said truck BCP drops from a second predetermined BCP to a third predetermined BCP;

c) a release time adjustment means connected to said first testing means for one of adding and subtracting to and from, respectively, a release time and hold time depending on said elapsed time;

d) a release time decision means for detecting if said release time adjustment means has changed said

release time, and a reapply brake cylinder pressure means connected to said release time decision means for enabling again said first testing means if said release time has changed;

- 5 e) an exhaust brake cylinder pressure means connected to said release time decision means for sending a pulsed release signal and a pulsed hold signal to said control valve and determining if an exhaust BCP is less than a predetermined amount after said
- 10 pulsed release signal and pulsed hold signal;
- f) a second testing means connected to a continue decision means for applying an apply pulse to said control valve for a predetermined time and timing a BCP rise between a fourth predetermined BCP and a
- 15 fifth predetermined BCP;
- g) an apply time adjustment means connected to said second testing means for one of adding and subtracting to and from, respectively, an apply time and hold time depending on said time of said
- 20 BCP rise between said fourth predetermined BCP and said fifth predetermined BCP; and
- h) an apply time decision means connected to said apply time adjustment means for sending one of an enabling signal to a release brake cylinder

pressure means if said apply time has changed and  
an end wheel slip control valve test signal, said  
release brake cylinder pressure means, when  
enabled, for enabling again said second testing  
means.

5

2. A microprocessor based smart resolution valve pressure  
control system, according to claim 1, wherein said  
microprocessor based smart resolution valve pressure control  
10 system further includes:

a) a begin decision means connected intermediate said  
sensing means and said first testing means for  
communicating a signal generated in said sensing  
means; and

15

b) a first message communication means connected to  
said begin decision means for ending said wheel  
slip control valve response test and sending a  
wheel slip response not run message when one of  
said brakes disposed on said truck are not at full  
20 service and said first truck BCP is less than said  
first predetermined BCP.

20

3. A microprocessor based smart resolution valve pressure  
control system, according to claim 1, wherein said

microprocessor based smart resolution valve pressure control system further includes:

a) said continue decision means connected intermediate said exhaust brake cylinder pressure means and said second testing means for communicating a signal generated in said exhaust brake cylinder means; and

b) a second message communicator means connected to said continue decision means for ending said wheel slip control valve response test and sending a wheel slip response not run message if said exhaust BCP is greater than said predetermined amount.

4. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said first predetermined pressure is about 60 psi or greater.

5. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said predetermined amount is less than about 1 psi.

6. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said second predetermined BCP and said third predetermined BCP are about 55 psi and about 5 psi, respectively.

7. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said fourth predetermined BCP and said fifth predetermined BCP is about 5 psi and about 50 psi, respectively.

5

8. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said release time adjustment means adds to said release time if said elapsed time is greater than 750 milliseconds (ms), and subtracts from said  
10 release time if said elapsed time is less than 720 ms.

9. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said apply time adjustment means adds to said apply time if said time of said  
15 BCP rise is greater than 1080 ms, and subtracts from said apply time if said time of said BCP rise is less than 1050 ms.

10. An apparatus used to control a wheel slip control magnet valve, said apparatus comprising:

- 20           a) a logic control means for providing one of a release time and an application time together with a hold time;
- b) a change decision means connected to said logic control means for determining if said one of a

release time and an application time, and said hold time have changed since a last cycle of said apparatus used to control a wheel slip control magnet valve;

5 c) a valve timing set up means connected to said change decision means for setting said one of a release time and an application time, and said hold time if said one of a release time and an application time have changed;

10 d) a pulse timing means connected to said change decision means and said valve timing set up means for determining if a remaining pulse time is equal to 0, and enabling a hold timing means if said remaining pulse time is equal to 0, and enabling a pulse timer decrement means if said remaining pulse time is greater than 0;

15 e) a hold timing means connected to said pulse timing means for determining if a remaining hold time is equal to 0, and enabling a timer's reset means if said remaining hold time is equal to 0, and enabling a hold timer decrement means if said remaining hold time is greater than 0, said pulse timer decrement means and said hold timer decrement means for decrementing one of said remaining pulse

20

time and said remaining hold time, respectively,  
and for enabling a valve control means, said  
timer's reset means for resetting said pulse timing  
means and said hold timing means;

5 f) a valve control means connected to said pulse timer  
decrement means and said hold timer decrement means  
for enabling a magnet valve based on one of said  
pulse time and said hold time; and

10 g) an end interrupt routine means connected to said  
valve control means for one of ending a current  
repetition of controlling said wheel slip control  
magnet valve after one of said enabling said magnet  
valve, and resetting said pulse timing means and  
said hold timing means.

15  
11. An apparatus used to control a wheel slip control  
magnet valve, according to claim 10, said apparatus further  
including a closed loop feedback means disposed between said  
timer's reset means and said end interrupt routine means to  
20 recalibrate a current pulse time and a current hold time, if  
necessary.

12. An apparatus used to control a wheel slip control  
magnet valve, according to claim 10, wherein said one of a



release time and an application time and said hold time correspond to one of a plurality of pressure rate response values.

5        13. An apparatus used to control a wheel slip control magnet valve, according to claim 10, wherein said pulse state, pulse time and hold time are stored in a microprocessor.

10        14. A method for calibrating a smart resolution valve pressure control having a plurality of release times and a corresponding plurality of hold times said method comprising the additional steps of:

15            a) applying a release pulse of one of a first predetermined duration of a selected one of said plurality of release times and applying a hold pulse of a second predetermined duration corresponding to said selected one of said plurality of release times to a valve controlling pressure to a brake cylinder initially having a minimum first predetermined pressure;

20

          b) measuring an elapsed time that said brake cylinder changes from a second predetermined pressure to a third predetermined pressure;

- c) increasing said first predetermined duration and decreasing said second predetermined duration if said elapsed time is greater than a first predetermined time, and decreasing said first predetermined duration and increasing said second predetermined duration if said elapsed time is less than a second predetermined time; and
- d) repeating steps (a) through (c) if said first predetermined duration changes in step (c).

15. A method for calibrating a smart resolution valve pressure control, according to claim 14, wherein said method further includes:

- a) receiving a signal to apply said selected one of said plurality of release times and said corresponding hold time;
- b) determining if said selected one of said plurality of release times corresponds to a last preceding repetition of said smart resolution valve pressure control, and if so, continuing to apply said selected one of said release time and hold times.

16. The method for calibrating a smart resolution pressure control, according to claim 15, wherein step (b) includes the

step of resetting a stored release time and hold time in said smart resolution pressure control to a current release time if said current release time is different than that of said last preceding repetition and applying said current release time.

5

17. A method for calibrating a smart resolution valve pressure control having a plurality of application times and a corresponding plurality of hold times said method comprising the steps of:

10

a) applying an application pulse of a first predetermined duration of a selected one of said plurality of application times and applying a hold pulse of a second predetermined duration corresponding to said selected one of said plurality of application times to a valve controlling pressure to a brake cylinder initially having a maximum first predetermined pressure;

15

b) measuring an elapsed time that said brake cylinder changes from a second predetermined pressure to a third predetermined pressure;

20

c) increasing said first predetermined duration and decreasing said second predetermined duration if said elapsed time is greater than a first predetermined time, and decreasing said first

predetermined duration and increasing said second predetermined duration if said elapsed time is less than a second predetermined time; and

d) repeating steps (a) through (c) if said first predetermined duration changes in step (c).

18. A method for calibrating a smart resolution valve pressure control, according to claim 17, wherein said method further includes:

a) receiving a signal to apply said selected one of said plurality of application times and said corresponding hold time; and

b) determining if said selected one of said plurality of application times corresponds to a last preceding repetition of said smart resolution valve pressure control, and if so, continuing to apply said selected one of said release times and hold times.

19. The method for calibrating a smart resolution pressure control, according to claim 18, wherein step (b) includes the step of resetting a stored application time and hold time in said smart resolution pressure control to a current application time if said current application time is different than that of

said last preceding repetition and applying said current application time.